

TABLE OF CONTENTS

Section		Page
Volume One		
ABSTRACT		ABS-1
SUMMARY		SUM-1
Introduction		SUM-1
The Planning Area		SUM-1
Preparers of the FEIS		SUM-1
Coal Bed Methane.....		SUM-1
Chapter 1: Purpose and Need		SUM-2
Conformance with BLM Land Use Plans		SUM-2
Consultation		SUM-2
Chapter 2: Alternatives.....		SUM-6
Alternatives Considered.....		SUM-6
Comparison of Impacts		SUM-6
Chapter 3: Affected Environment		SUM-11
Chapter 4: Environmental Consequences.....		SUM-12
Resources with Low Intensity Impacts		SUM-12
Resource Impacts that are Important Features of Alternative E.....		SUM-12
Chapter 5: Consultation and Coordination		SUM-14
ACRONYMS.....		ACR-1
CHAPTER 1: PURPOSE OF AND NEED FOR ACTION		1-1
Introduction		1-1
Conformance With the BLM Land Use Plans.....		1-1
The Planning Area.....		1-2
Purpose of and Need for Action		1-2
Planning Criteria		1-2
Introduction.....		1-2
Overall Considerations.....		1-5
Roles and Agency Responsibilities		1-5
Bureau of Land Management.....		1-5
State of Montana		1-7
Tribal Governments		1-10
Other Federal Agencies.....		1-12
Issues.....		1-19
Air Quality and Climate		1-19
Cultural Resources		1-19
Geology and Minerals.....		1-19
Hazardous Materials and Waste Management		1-19
Hydrology		1-19
Indian Trust Resources and Native American Concerns.....		1-20
Lands and Realty.....		1-20
Livestock Grazing		1-20
Paleontological Resources		1-20
Recreation		1-20

TABLE OF CONTENTS
CONTINUED

Section	Page
Social and Economic Values.....	1-20
Environmental Justice	1-21
Soils	1-21
Vegetation	1-21
Visual Resource Management.....	1-22
Wilderness Study Areas	1-22
Wildlife	1-22
CHAPTER 2: ALTERNATIVES.....	2-1
Introduction	2-1
Alternatives Development.....	2-1
Air Quality	2-1
Coal Mines	2-1
Coal Bed Methane.....	2-1
Hydrology	2-2
Realty	2-2
Indian Trust Resources.....	2-2
Environmental Mitigation	2-2
Alternatives Considered But Not Analyzed in Detail.....	2-2
Leasing.....	2-2
Bonding.....	2-3
Omega Alternative	2-3
Alternate Sources of Energy	2-3
Re-Injection of Produced Water into the Same Aquifer Alternative.....	2-3
Phased Development.....	2-4
Management Common to All Alternatives.....	2-4
Bureau of Land Management.....	2-4
State of Montana	2-4
Mitigation Measures	2-5
Management Actions Specific to Each Alternative.....	2-5
Alternative A—No Action (Existing Management)	2-5
Alternative B—Emphasize Soil, Water, Air, Vegetation, Wildlife, and Cultural Resources.....	2-10
Alternative C—Emphasize CBM Development	2-12
Alternative D—Encourage Exploration and Development While Maintaining Existing Land Uses.....	2-12
Alternative E—Preferred Alternative.....	2-13
Comparison of Alternatives.....	2-17
CHAPTER 3: AFFECTED ENVIRONMENT	3-1
Introduction	3-1
Air Quality	3-1
Topography	3-1
Climate and Meteorology.....	3-1
Existing Air Quality	3-1
Regulatory Framework	3-3
Cultural and Historical	3-5
Geology and Minerals	3-8
Regional Geology	3-9
Stratigraphy	3-9
Sediments in the Powder River Basin	3-10
Conventional Oil and Gas	3-20
Coal Bed Methane.....	3-20
Coal	3-20
Mineral Materials.....	3-21

TABLE OF CONTENTS
CONTINUED

Section	Page
Locatable Minerals.....	3-21
Hydrological Resources	3-22
Surface Water.....	3-22
Groundwater	3-31
Water Rights	3-38
Indian Trust Assets.....	3-40
Background.....	3-40
Applicable Laws	3-40
The Crow Tribe.....	3-41
The Northern Cheyenne Tribe	3-41
Fort Belknap Community.....	3-42
The Turtle Mountain Public Domain Allotments.....	3-42
Lands and Realty	3-43
Livestock Grazing	3-47
Native Americans.....	3-48
The Crow Indian Reservation	3-48
Northern Cheyenne Reservation	3-57
Paleontological Resources.....	3-73
Recreation	3-74
Federal	3-74
State	3-74
Local/City Recreation	3-75
Private Lands	3-75
Social and Economic Values.....	3-76
Demographics	3-76
Social Organization.....	3-80
Economics	3-82
Government Revenue Sources	3-87
Environmental Justice	3-93
Soils.....	3-95
Solid and Hazardous Wastes	3-96
Vegetation	3-97
Plant Communities.....	3-97
Species of Concern.....	3-98
Visual Resource Management.....	3-100
Wilderness Study Areas	3-101
Wildlife	3-102
Mammals	3-102
Birds.....	3-103
Reptiles and Amphibians	3-105
Species of Concern.....	3-105
Aquatic Resources.....	3-108
CHAPTER 4: ENVIRONMENTAL CONSEQUENCES	4-1
Introduction	4-1
Analysis Assumptions and Guidelines	4-1
Potential for Development—Reasonably Foreseeable Development Scenario.....	4-1
Assumptions Common to All Alternatives	4-5

TABLE OF CONTENTS
CONTINUED

Section	Page
Resource Topics	4-13
Air Quality and Climate	4-13
Cultural Resources	4-37
Geology and Minerals	4-41
Hydrological Resources	4-47
Indian Trust and Native American Concerns	4-87
Lands and Realty	4-94
Livestock Grazing	4-101
Paleontological Resources	4-105
Recreation	4-107
Social and Economic Values	4-111
Soils	4-134
Solid and Hazardous Waste	4-141
Vegetation	4-143
Visual Resource Management	4-154
Wilderness Study Areas	4-157
Wildlife	4-159
CHAPTER 5: CONSULTATION AND COORDINATION	5-1
Introduction	5-1
Public Participation	5-1
Consultation with U.S. Fish and Wildlife Service on Threatened and Endangered Species	5-2
Consultation and Coordination with Native American Tribes	5-2
Consistency	5-3
Comments and Responses	5-4
Alternatives and Other Management Concerns	5-4
Air Quality and Climate	5-13
Cultural Resources	5-30
Geology and Minerals	5-32
Hydrological Resources	5-41
Lands and Realty	5-64
Livestock Grazing	5-68
Recreation	5-69
Social and Economic Values	5-70
Soils	5-85
Solid and Hazardous Waste	5-88
Vegetation	5-89
Visual Resource Management	5-93
Wilderness Study Areas	5-93
Wildlife	5-94
Distribution List	5-111
List of Preparers	5-121
BLM Coordination Support and Review	5-121

Tables

S-1	Alternative Management For CBM	SUM-7
S-2	Comparison Summary of Impacts	SUM-15
1-1	Applicable Permits/Reviews for Oil and Gas Development Activities	1-14
1-2	Permitable Activities for CBM Development	1-17
2-1	Mitigation Measures Common to All Alternatives	2-5
2-2	Alternative Management for CBM	2-18
2-3	Comparison Summary of Impacts	2-22

TABLE OF CONTENTS
CONTINUED

Tables		Page
3-1	Assumed Background Concentrations of Regulated Air Pollutants ($\mu\text{g}/\text{m}^3$)	3-2
3-2	Applicable Ambient Air Quality Standards and PSD Increment Values ($\mu\text{g}/\text{m}^3$).....	3-4
3-3	Cultural Resource Sites Identified by SHPO within each County of the Planning Area.....	3-6
3-4	Surface Water Discharge and Water Quality For 7Q10 And Low Monthly Mean Flows at Selected USGS Stations.....	3-26
3-5	Water Use (in Millions of Gallons per Day) Statistics in 1995 by Watershed and/or Groundwater Use ...	3-28
3-6	Impaired Water Bodies in Area of Maximum CBM Potential	3-29
3-7	Planning Area Aquifers and Their General Characteristics.....	3-35
3-8	Groundwater Quality for the Montana Portion of the Powder River Basin	3-38
3-9	Water Rights Development Summary by Watershed.....	3-39
3-10	Indian Trust Assets.....	3-40
3-11	Land Ownership	3-44
3-12	Miles of Road/Highway	3-45
3-13	Miles of Railroad ROW	3-46
3-14	Tribal Poverty Rates Among Those Employed (1999)	3-50
3-15	Average Annual Unemployment Rates by Reservation	3-50
3-16	Groundwater Sodium Absorption Ratio and Total Dissolved Solids Values, Crow Indian Reservation.....	3-55
3-17	Average Annual Gage and Estimated Natural Flows for the Tongue River near the Northern Cheyenne Reservation (Study Period 1940-1982, HKM 1983)	3-63
3-18	Average Estimated Natural Flows for Rosebud Creek, Northern Cheyenne Reservation (Study Period 1939-1981)	3-63
3-19	Comparison of Previously Cited Water Quality Parameters with Long-Term Average Figures, Tongue River at State Line.....	3-63
3-20	Water-Quality of the Alluvium on the Northern Cheyenne Reservation	3-66
3-21	Revised Numeric Standards for EC and SAR and TDS Indicator Values.....	3-70
3-22	Historical Population and Population Forecasts	3-76
3-23	Race/Ethnicity as Percent of Total Population	3-77
3-24	Poverty Status by County (as Defined by U.S. Census Bureau) (1997).....	3-79
3-25	Housing Units.....	3-81
3-26	Montana Employment Trends by Sector	3-83
3-27	State Employment Versus Planning Area Employment by Sector (1998)	3-84
3-28	Planning Area Employment by County and Sector (1998)	3-85
3-29	Average Annual Unemployment Rates by County	3-86
3-30	Tribal Workforce and Unemployment (1999).....	3-87
3-31	Per Capita Income, 1996-1998	3-88
3-32	Total Taxes Collected in Montana (2000).....	3-89
3-33	Revenues Received from Minerals Management on State Lands in FY 2000	3-90
3-34	Onshore Federal Mineral Revenue Disbursements Identified by County of Origin, Fiscal Year 2000, Montana.....	3-91
3-35	Endangered, Threatened, and Proposed Plant Species Present in the CBM Emphasis Area	3-99
3-36	Endangered, Threatened, and Proposed Animal Species Present in the CBM Emphasis Area.....	3-106
3-37	Special Status Aquatic Species Present in the CBM Emphasis Area	3-113
4-1	Level of Disturbance	4-6
4-2	Non-Project and Project Total Emissions Summary	4-16
4-3	Alternative A—Project Sources Criteria Pollutant Impacts	4-20
4-4	Alternative A Potential NAAQS/MAAQS Exceedances	4-21
4-5	Alternative A Potential PSD Increments Exceedances	4-21
4-6	Alternative A Class I Area Potential Visibility Impacts.....	4-21
4-7	Alternative A Class	4-23
4-8	Alternative B—Project Sources Criteria Pollutant Impacts	4-25
4-9	Alternative B Potential NAAQS/MAAQS Exceedances	4-27
4-10	Alternative B Potential PSD Increments Exceedances.....	4-27

TABLE OF CONTENTS
CONTINUED

Tables	Page
4-11 Alternative B Class I Area Potential Visibility Impacts	4-29
4-12 Alternative B Class II Area Potential Visibility Impacts.....	4-30
4-13 Alternative D—Project Sources Criteria Pollutant Impacts	4-32
4-14 Alternative D Potential NAAQS/MAAQS Exceedances	4-32
4-15 Alternative D Potential PSD Increments Exceedances	4-33
4-16 Alternative D Class I Area Potential Visibility Impacts.....	4-34
4-17 Alternative D Class II Area Potential Visibility Impacts	4-35
4-18 Summary of Proposed Limits for Montana Surface Water	4-49
4-19 Effects on Surface Waters of the Tongue River under Alternative A	4-53
4-20 Effects on Surface Waters in the Powder River under Alternative A.....	4-53
4-21 Effects on Surface Waters of the Little Powder River under Alternative A	4-54
4-22 Effects on Surface Water of Mizpah Creek under Alternative A	4-55
4-23 Effects on Surface Waters of the Little Bighorn and Bighorn Rivers under Alternative A.....	4-56
4-24 Effects on Surface Water of Rosebud Creek under Alternative A	4-56
4-25 Effects on Surface Water of the Yellowstone River Under Alternative A	4-57
4-26 Groundwater Depletion by CBM Development in the Montana Powder River Basin	4-63
4-27 Effects on Surface Waters of the Tongue River under Alternative C.....	4-67
4-28 Effects on Surface Waters in the Powder River under Alternative C.....	4-68
4-29 Effects on Surface Waters in the Mizpah Creek under Alternative C	4-69
4-30 Effects on Surface Waters of the Bighorn and Little Bighorn Rivers under Alternative C.....	4-70
4-31 Effects on Surface Water of Rosebud Creek under Alternative C.....	4-71
4-32 Effects on Surface Water of the Yellowstone River under Alternative C	4-72
4-33 Summary of Surface Water Parameters Before and After Mixing Untreated CBM Discharge from Wyoming and Treated CBM Discharges from Montana Under Alternative D	4-73
4-34 Effects on Surface Water Forecast to the Tongue River Under the Preferred Alternative E.....	4-76
4-35 Water Management Framework for the Tongue River Watershed under the Preferred Alternative	4-78
4-36 Effects on Surface Waters of the Little Bighorn and Bighorn Rivers Under the Preferred Alternative E	4-79
4-37 Water Management Framework for the Bighorn River Watershed under the Preferred Alternative E	4-80
4-38 Effects on Surface Water in the Rosebud Creek Under the Preferred Alternative E.....	4-80
4-39 Water Management Framework for the Rosebud Creek Drainage under the Preferred Alternative E	4-80
4-40 Effects on Surface Water in the Powder River Under the Preferred Alternative E	4-81
4-41 Effects on Surface Waters of Mizpah Creek Drainage Under the Preferred Alternative E	4-82
4-42 Water Management Framework for the Powder River Watershed under the Preferred Alternative E.....	4-82
4-43 Water Management Framework for the Mizpah Creek Drainage under the Preferred Alternative E.....	4-83
4-44 Effects on Surface Water in the Yellowstone River Under the Preferred Alternative E	4-83
4-45 Water Management Framework for the Yellowstone Watershed Upstream Sidney, MT under the Preferred Alternative E.....	4-84
4-46 Cumulative Impacts on Surface Waters under Wyoming's Alternative 2A and Montana's Alternative E	4-85
4-47 Number of Predicted Animal Unit Months (Aums) Lost to Exploration, Construction, and Production	4-103
4-48 Alternative A: Estimated Wages and Jobs for Well Development, Production, and Abandonment	4-113
4-49 Alternatives B, C, D, and E: Estimated Wages and Jobs for Well Development, Production, and Abandonment	4-117
4-50 Total Proposed Wells and Percent By County (Alternatives B, C, D, and E)	4-119
4-51 Example: Partial District-Wide Weed Prevention Schedule	4-145
4-52 Amount of Acreage with Underlying Coal Beds in Each Habitat Type (by RMP Area and State Land)	4-147
4-53 Acreage Potentially Impacted in Each Habitat Type for Alternative A (by RMP Area and State-Permitted Land).....	4-147
4-54 Acres of Land and Length of Roads and Utility Corridors Directly Impacted by New CBM Construction	4-150

TABLE OF CONTENTS
CONTINUED

Tables	Page
4-55 Existing Wildlife-Related Lease Stipulations Covering CBM Exploration and Development on BLM Lands	4-161
4-56 Vulnerability of Wildlife to Types of CBM Impacts, Alternative A	4-165
4-57 Area of Indirect Impacts and Indirect Wildlife Disturbance and Displacement Within and Around CBM Well Fields for More Sensitive Wildlife Species for Alternatives B, C, D, and E	4-173
 Figures	
3-1 Stratigraphic Column of the Tertiary, Mesozoic, and Part of the Paleozoic Sediments in the Montana and Wyoming Portions of the Powder River Basin.....	3-16
3-2 Stratigraphic Column of Upper Cretaceous and Lower Tertiary Sediments in the Powder River Basin.....	3-17
3-3 Stratigraphic Variation of the Anderson-Canyon Coals in the Area of the Decker Mine, Powder River Basin, Montana (Roberts et al., 1999a)	3-18
3-4 Variation in Surface Water Quality with Flow at USGS Station 06306300 on the Tongue River near Decker, Based upon USGS Data from October 16, 1985 to September 12, 2000.....	3-27
3-5 Principal Aquifers	3-37
4-1 Production at the CX Ranch.....	4-11
4-2 Water Quality Plot Before and After Mixing with Wyoming's Alternative 2A and Montana's Alternative CBM Discharges, Tongue River near Decker, Montana	4-76
 Maps	
S-1 Planning Areas	SUM-3
1-1 Planning Areas	1-3
3-1 Tectonic Element Map of the State of Montana.....	3-11
3-2 Statewide Outcrop Geology	3-12
3-3 Statewide Coal Occurrence Map.....	3-13
3-4 Outcrop Geology and Clinker Deposits of the Montana Portion of Powder River Basin	3-14
3-5 Water Well Use, Current CBM Production, and CBM Likelihood in Powder River Basin	3-15
3-6 Surficial Aquifers	3-23
3-7 Surficial Aquifers—Water Quality.....	3-24
3-8 Powder River Basin Watersheds and Area USGS Gauging Stations	3-25
3-9 Bedrock Aquifers	3-33
3-10 Bedrock Aquifers—Water Quality.....	3-34
4-1 CBM Development Based on Reasonably Foreseeable Development Scenario	4-3
4-2 Location Map, Regional Coal Mines.....	4-59
 Glossary	GLO-1
 Bibliography	BIB-1
 Index	IND-1

TABLE OF CONTENTS
CONTINUED

Volume Two

Appendices

Air Quality
Hydrology
Minerals
Monitoring
Northern Cheyenne Proposed Mitigation
Socioeconomics
Soils
Solid and Hazardous Waste
Vegetation
Wildlife

Acronyms and Abbreviations

Δdv	change in deciview
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
AOU	American Ornithologist's Union
ANC	acid neutralizing capacity
APD	Application for Permit to Drill
PLIC	Avian Power Line Interaction Committee
AQRV	Air Quality Related Value
ARCO	Atlantic-Richfield Company
ARM	Administrative Rules of Montana
Argonne	Argonne National Laboratory
ARS	Agricultural Research Service
AUMs	animal unit-months
AWM	Air and Waste Management Bureau
BACT	Best Available Control Technology
BCF	billion cubic feet
BER	Board of Environmental Review
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
BTU	British thermal unit
CAA	Clean Air Act
CBM	coal bed methane
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFS	cubic feet per second
CH ₄	methane
CO	carbon monoxide

ACRONYMS AND ABBREVIATIONS

CO ₂	carbon dioxide
COA	Condition of Approval
COE	U.S. Army Corps of Engineers
CSU	Controlled Surface Use
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DOE	U.S. Department of Energy
DNRC	Department of Natural Resources and Conservation (Montana)
dv	deciview
EA	Environmental Assessment
EC	electrical conductivity
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLM	Federal land managers
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
FWS	Fish and Wildlife Service (USDI)
FY	fiscal year
gpm	gallons per minute
GPO	Government Printing Office
GTI	Gas Technology Institute
HAP	hazardous air pollutants
HCP	Habitat Conservation Plan
HUD	U.S. Department of Housing and Urban Development
H ₂ S	hydrogen sulfide
ICC	Interstate Commerce Commission
ITA	Indian Trust Assets
kW	kilowatt

LGST	local government severance taxes
LRPL	Least Restrictive Proposed Limit
MAAQS	Montana Ambient Air Quality Standards
MBMG	Montana Bureau of Mines & Geology
MBOGC	Montana Board of Oil & Gas Conservation
MBTA	Migratory Bird Treaty Act
MCA	Montana Code Annotated
MCF	thousand cubic feet
MDA	Montana Department of Agriculture
MDEQ	Montana Department of Environmental Quality
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFWP	Montana Fish, Wildlife, and Parks
mg/l	milligrams per liter
MGWPCS	Montana Groundwater Pollution Control System
MMB	Minerals Management Bureau
MNHP	Montana Natural Heritage Program
MPDES	Montana Pollutant Discharge Elimination System
MOA	Memorandum of Agreement
MRPL	Most Restrictive Proposed Limit
MSO IM	Montana State Office Instruction Memorandum
MTDEQ-AWM	Montana DEQ-Air & Waste Management Bureau
MT-GAP	Montana Gap Analysis Project
MOU	Memorandum of Understanding
MYBP	Millions of Years Before Present
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
NOA	Notice of Availability
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System

ACRONYMS AND ABBREVIATIONS

NPS	National Park Service (USDI)
NRCS	Natural Resources Conservation Service (USDA)
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System (Montana)
NSO	no surface occupancy
NWP	Nationwide 404 Permit
NWR	National Wildlife Refuge
OF	Open File (Report)
OSHA	Occupational Safety and Health Administration
PM ₁₀	particulate matter less than 10 microns in diameter (inhalable particulate matter)
PM _{2.5}	particulate matter less than 2.5 microns in diameter (fine particulate matter)
POD	Plan of Development
ppm	parts per million
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
RCRA	Resource Conservation and Recovery Act of 1976
RFFA	Reasonably Foreseeable Future Actions
RFD	Reasonably Foreseeable Development
RMP	Resource Management Plan
RMU	Regional Monitoring Unit
ROD	Record of Decision
ROW	right-of-way
SAR	Sodium Adsorption Ratio
SCMA	Surface Coal Mining Act of 1977
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office
SIP	State Implementation Plan (Montana)
SMA	Special Management Area
SOC	Species of Concern
SN	Sundry Notice
SO ₂	sulfur dioxide
SR	State Road (when followed immediately by the State Road number)

SWQATR	Surface Water Quality Analysis Technical Report
T&E	Threatened and Endangered
TAC	Technical Advisory Committee
TCF	trillion cubic feet
TCP	traditional cultural property
TDS	total dissolved solids
TLMD	Trust Land Management Division
TMDL	total maximum daily load
TOC	total organic carbon
$\mu\text{eq/l}$	microequivalents per liter
$\mu\text{g/m}^3$	micrograms per cubic meter
$\mu\text{S/cm}$	micro-Siemens per centimeter
UIC	underground injection control
U.S.	United States
USBR	Bureau of Reclamation (USDI)
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service (USDA)
USGS	U.S. Geological Survey (USDI)
VOC	volatile organic compounds
VMT	vehicle miles traveled
VRM	visual resource management
WET	whole effluent toxicity
WMA	Wildlife Management Area
WMP	Water Management Plan
WMPP	Wildlife Monitoring and Protection Plan
WQS	water quality standards
WRTR	Water Resources Technical Report
WSA	Wilderness Study Area
WYDEQ	Wyoming Department of Environmental Quality